Global Security summer interns win Distinguished Student, Student Symposium and poster awards

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As summer comes to a close, the Global Security directorate bids farewell to their summer interns and congratulates the 2019 Distinguished Student, 2019 Student Symposium and Poster Award winners, nominees and mentors.

2019 Distinguished Student award winners

Sarah Baty
Mentor: James Brooks
Over the past 5 years, Sarah contributed to numerous programs and projects in direct support of the Nuclear Emergency Response Community, most of which most are classified and sensitive in nature. This past spring and continuing on through the summer, Sarah identified a mission need for specialized user training. Sarah developed video-based-training for external customers and partners. This video training allows for new Emergency Responders, external partners and key leaders to quickly become current by watching videos specifically created for many secure data systems. Sarah completed several training videos, contributed to policy and procedure documents, assisted with live training for Nuclear Emergency Responders and provided data analytics in a key classified system.

Sergio Cordova
Mentor: Hari Khalsa
Sergio Cordova's contributions to Epi Archive, a software program funded by DTRA that collects and stores global notifiable disease data from public health websites around the world, was critical to the success of the project. Sergio was the principle software developer responsible for designing the infrastructure, writing code to implement it, and developing several test cases to ensure the robustness of the program. He also conducted nearly all of the maintenance on the site and responded to sponsor requests. Sergio also developed innovative approaches to predict user needs and make data quickly available.

2019 Student Symposium winners

At the end of each summer internship season, the Partnerships & Pipeline Student Programs Office at the Lab hosts a Student Symposium. The Symposium provides a unique opportunity for students to present their research and is an excellent forum for students to network and make professional contacts. The following students won awards for their related research:

Hayden Jones: Robust Detection of Computer Generated Text
Mentor: Juston Moore
State of the art language models are now capable of generating lengthy, coherent texts after only being fed a short prompt. This could lead to abuses such as automated propaganda/fake-news generation, online impersonation and more. Techniques are being developed to classify a given text as human or machine written, however, many of these techniques are not robust when it comes to adversarial attacks. Hayden's work presents the performance, both in terms of classification accuracy and adversarial robustness, of a sparse- coding based classifier designed to solve this task. It also explores further applications of textual sparse-coding, such as filling in missing words from a document.

Vedant Mehta: Powering the Red Planet in Pursuit of Becoming Interplanetary Species
Mentor: Patrick McClure
Microreactors are state-of-the-art reactor concepts with power levels rated between 1 kWe to 10 MWe. Yttrium-Hydride is being considered as a primary moderator for microreactors due to its superior hydrogen containment capability compared to other hydrides. However, all hydrides experience hydrogen dissociation (and thus losses) at elevated temperatures. This loss affects the neutronics of the system due to the availability of less hydrogen, and hence less moderation. In the first part of the study, Vedant and team investigated material data generation from the first principle quantum mechanical simulations. These properties include thermal scattering laws, diffusion coefficients, heat capacities etc. In parallel, advanced multiphysics simulation techniques were developed to further understand the dependence of neutronics and thermomechanics on hydrogen dissociation. The newly created data from quantum mechanics was then implemented in the advanced multiphysics toolset to properly understand how the microreactor would evolve over time. Finally, system optimization is applied to generate the ideal reactor candidate for space applications including nuclear electric propulsion and surface power production. Vedant's presentation covered material data generation, benchmark, multiphysics toolset creation and system optimization.

David Butts: Using TRANSIMS for Evacuation Planning
Mentor: James Cooley
Evacuations of cities are necessary during emergency events like hurricanes and forest fires however preparation can be difficult due to the impracticability of evacuating a city during a non-emergency (i.e. practice drills) as well as the unpredictability of such events. Simulation can help bridge this gap with very little associated costs by allowing for multiple scenarios and response plans to be tested for a particular city. Transportation Analysis and Simulation System (TRANSIMS) is an open source, agent based traffic microsimulator that allows for detailed simulations of city traffic. In their project, David and team used TRANSIMS to explore forest fire evacuation strategies for Los Alamos County. The strategies tested included simultaneous and staged

evacuations, as well as the effects of opening back roads. They ran a simulation by creating a synthetic road network with daily traffic and then added evacuees to the network in a way that is consistent with one of the evacuation plans. The simulation allowed the team to see where congested roadways are and time how long an evacuation will take. This information can later be used to create better evacuation strategies.

Philippa Chadwick, Oscar Goodloe and Nilesh Mukundan: Quantitative Predictors of Political Instability in Pakistan
Mentors: Sara Del Valle and Geoffrey Fairchild
Philippa's, Oscar's and Nilesh's project assessed the relevant and impactful indicators for political instability in Pakistan. These indicators were selected through a systematic literature review looking at the causes of political instability on a global scale. To specify the literature review to Pakistan, country-specific searches were conducted to define which indicators were the most important for Pakistan and the region. Once indicators were compiled, the principal goal of the project in this early stage was the identification, collection, curation and preliminary analysis of data streams for these indicators to determine which are practical in a modeling context. Data was found for some key predictors, namely occurrences of terror events, violence history, changes in leadership and forest coverage. Using these predictors, the team developed a preliminary model of political instability utilizing a random forest model. The model shows promise as a preliminary step, and could conceivably improve with more predictors. The overall goal of this project was to develop regional political instability models that will provide near real-time political instability forecasts with quantified uncertainty. Early results indicate that data-centric approaches to instability modeling have great potential in predicting and understanding political instability.

Poster award winners

Haydn Jones - Category: Computing
Robust Detection of Computer Generated Text
Vedant Mehta - Category: Engineering
Powering the Red Planet in Pursuit of Becoming Interplanetary Species
Kelley Verner - Category: Engineering
Production of Molybdenum-99 via Fissile Solution Reactor and Electron Beam Accelerator
David Butts - Category: IT
Using TRANSIMS for Evacuation Planning
Philippa Chadwick, Oscar Goodloe and Nilesh Mukundan - Joint Project Category: Mathematics
Quantitative Predictors of Political Instability in Pakistan

2019 Distinguished Student Award Nominees
Vedant Mehta, Reuben Fresquez and Alisha Vira.

The Global Security Directorate welcomed 134 summer interns this year and on average have 35 graduate students and post-docs who work in various areas of GS year-round. If you or someone you know is interested in an internship with Los Alamos National Laboratory, or for more information on high school, undergraduate and graduate opportunities, see the Student Programs website.


NNSA
National Nuclear Security Administration